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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

	Application No.	Applicant(s)
Office Action Summary	10/769,777	SUNG ET AL.
	Examiner	Art Unit	
	Katrina Fujita	2624	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>02 August 2007</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-57</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-57</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   This Office Action is responsive to Applicant's remarks received on August 02,

2007. Claims 1-51 and newly added claims 52-57 remain pending.

Specification

2.   The previous specification objection has been withdrawn in light of Applicant's

amendment.

Claim Suggestions

3.   The previous claim suggestion has been withdrawn in light of Applicant's

amendment.

Claim Objections

4.   The following is a quotation of 37 CFR 1.75(a):

> The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

5.   Claim 8 is objected to under 37 CFR 1.75(a), as failing to particularly point out

and distinctly claim the subject matter which application regards as his invention or

discovery.

Claim 8 lacks antecedent basis for "the operation of determining whether to split

the sub block" in line 1. The following will be assumed for examination purposes: --the

operation of determining whether to split the ~~sub~~ macro block--.

Claim 8 lacks antecedent basis for "determining the possibility of splitting the sub

block" in line 6. The following will be assumed for examination purposes: --determining

the possibility of splitting the ~~sub~~ macro block--. This also applies to lines 7 and 8.

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7.   Claims 1-3, 10-16, 19, 22, 25-29, 36-42, 45, 48, 51, 52, 56 and 57 are rejected

under 35 U.S.C. 103(a) as being unpatentable over the combination of Mancini et al.

("Robust quadtree-based disparity estimation...", SPIE article) and Keith et al. (US 4,785,349).

Regarding **claims 1, 10, 25, 27, and 36**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a recording medium on which a method is written as a program code that can be read and executed on a computer (it is inherent that the method is written on a recording medium to enable the method to performed), the program coded method of splitting an image block ("identify problematic blocks...and then split them" at section 6.5, paragraph 2, line 1) comprising:

setting a plurality of splitting threshold values ("The steps above rely on three threshold values" at section 6.5.1, paragraph 3, line 10) for a macro block ("block B_{ij}" at section 6.5.1, paragraph 3, line 4) in an image frame and determining whether to split the macro block into sub blocks ("determine whether block B_{ij} requires splitting" at section 6.5.1, paragraph 3, line 6);

setting a plurality of splitting threshold values ("The steps above rely on three threshold values" at section 6.5.1, paragraph 3, line 10) for each sub block and determining whether to split each sub block into smaller sub blocks ("Sub-blocks that will still fall on object boundaries can undergo further splitting" at section 6.5, paragraph 2, line 5)

wherein the image frame is a binocular image frame ("intermediate image I_i (Fig. 1) from the left-right image pair" at section 2, paragraph 2, line 4) representing a three dimensional image ("the '3D-ness' of the data" at section 1, paragraph 1, line 9).

Mancini et al. does not disclose that determining whether to split the image block into sub blocks is performed by determining whether the image block has been split in a preceding frame at the same location.

Keith et al. discloses a system wherein the step of determining whether to split the macro block ("entire image area is selected as the target region. If this region cannot be adequately encoded, it is split into sub-regions" at col. 26, line 51) is done according to whether a preceding macro block at the same location in a preceding image frame as the current macro block ("region of a previous frame may be found that corresponds fairly well to a region being coded in a current frame" at col. 25, line 55) has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked for minimum size (3924). If the target region is larger than the minimum size, it is split" at col. 27, line 16) and the step of determining whether to split the sub block ("sub-regions which are subsequently examined for encoding" at col. 26, line 53) is done according to whether a preceding sub block at the same location in a preceding macro block as the current sub block ("region of a previous frame may be found that corresponds fairly well to a region being coded in a current frame" at col. 25, line 55) has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked for minimum size (3924). If the target region is larger than the minimum size, it is split" at col. 27, line 16).

It would have been obvious at the time the invention was made to one of ordinary skill in the art for the split condition of Mancini et al. to be determined using the inter-frame coding taught by Keith et al. as described above, for "one need only code the differences rather than the absolute values" (Keith et al. at column 25, line 57).

Regarding **claims 2, 3, 16, 26, 28, 29, 42, 52, 56 and 57**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a recording medium on which a method is written as a program code that can be read and executed on a computer (it is inherent that the method is written on a recording medium to enable the method to performed), the program coded method of splitting an image block, comprising:

setting a plurality of macro block splitting threshold values for splitting a macro block in an image frame into sub blocks and determining whether to split the macro block; and

setting a plurality of sub block splitting threshold values for splitting the sub block into smaller sub blocks and determining whether to split the sub block into smaller sub blocks.

Mancini et al. does not teach that the step of determining whether to split the macro block is done according to whether a preceding macro block at the same location in a preceding image frame as the current macro block has been split and the step of determining whether to split the sub block is done according to whether a preceding sub block at the same location in a preceding macro block as the current sub block has been split.

Keith et al. discloses a system wherein the step of determining whether to split

the macro block ("entire image area is selected as the target region. If this region

cannot be adequately encoded, it is split into sub-regions" at col. 26, line 51) is done

according to whether a preceding macro block at the same location in a preceding

image frame as the current macro block ("region of a previous frame may be found that

corresponds fairly well to a region being coded in a current frame" at col. 25, line 55)

has been split ("If the comparison indicates that this best choice for a translated region

does not provide an acceptable match to the target region, the target region is checked

for minimum size (3924). If the target region is larger than the minimum size, it is split"

at col. 27, line 16) and the step of determining whether to split the sub block ("sub-

regions which are subsequently examined for encoding" at col. 26, line 53) is done

according to whether a preceding sub block at the same location in a preceding macro

block as the current sub block ("region of a previous frame may be found that

corresponds fairly well to a region being coded in a current frame" at col. 25, line 55)

has been split ("If the comparison indicates that this best choice for a translated region

does not provide an acceptable match to the target region, the target region is checked

for minimum size (3924). If the target region is larger than the minimum size, it is split"

at col. 27, line 16).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art for the split condition of Mancini et al. to be determined using the inter-

frame coding taught by Keith et al. as described above, for "one need only code the

differences rather than the absolute values" (Keith et al. at column 25, line 57).

Regarding **claims 11, 12, 19, 37, 38, and 45**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method wherein the image frame is a binocular image frame representing a three dimensional image as described in the 103 rejection of claim 10 above.

Regarding **claims 13, 39 and 51**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and method of splitting a block comprising:

splitting macro image blocks ("determine whether block B_{ij} requires splitting" at section 6.5.1, paragraph 3, line 6) each of left-eye views and right eye views ("stereoscopic test images" at section 6.5, paragraph 1, line 2) into sub image blocks ("split them into four equal-sied sub-blocks" at section 6.5, paragraph 2, line 1) according to quadtree disparity estimation ("Quadtree disparity estimation" at section 6 .5) and splitting each sub block into smaller sub blocks ("Sub-blocks that will still fall on object boundaries can undergo further splitting" at section 6.5, paragraph 2, line 5).

Regarding **claims 14, 15, 22 40, 41 and 48**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method wherein the operation of splitting is performed using quadtree disparity estimation as described in the 103 rejection of claim 13 above.

8.   Claims 4-9, 17, 18, 20, 21, 23, 24, 30-35, 43, 44, 46, 47, 49, 50, 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Mancini et al.

and Keith et al. as applied to claims 1 and 27 above, and further in view of Boyce (US 5,208,673).

Regarding **claims 4, 6, 30, 32, 53**, the Mancini et al. and Keith et al. combination discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method of splitting a block wherein the operation of setting a plurality of splitting threshold values for a macro block in an image frame and determining whether to split the macro block into sub blocks and wherein the operation of setting a plurality of splitting threshold values for each sub block and determining whether to split each sub block into smaller sub blocks comprises:

determining the possibility of splitting the macro block ("determine whether block B_{ij} requires splitting" Mancini et al. at section 6.5.1, paragraph 3, line 6) by determining whether the ratio of maximum mean absolute difference (MAD) to minimum MAD of a sub block ("$\max(\kappa_i, i = 1,...,4)/\min(\kappa_i, I = 1,...,4) < \theta_3$" Mancini et al. at section 6.5.1, paragraph 3, line 9; "ratio of the maximum to the minimum number of outliers in the four sub-blocks" Mancini et al. at section 6.5.1, paragraph 3, line 13) in the macro block is greater than a threshold value ("threshold value θ_3" Mancini et al. at section 6.5.1, paragraph 3, line 12) for determining the possibility of splitting the macro block; and

determining whether to split the macro block by comparing the threshold value for determining the possibility of splitting the macro block ("Threshold θ_2" Mancini et al. at section 6.5.1, paragraph 3, line 11), and comparing the ratio of maximum MAD to minimum MAD, and a threshold value for determining whether to split the macro block with one another ("$\max(\kappa_i, i = 1,...,4)/\min(\kappa_i, I = 1,...,4) < \theta_3$" Mancini et al. at section

6.5.1, paragraph 3, line 9; "ratio of the maximum to the minimum number of outliers in

the four sub-blocks" Mancini et al. at section 6.5.1, paragraph 3, line 13), if a ratio is

greater than the threshold for determining the possibility of splitting the macro block ("if

$\Sigma \kappa_i < \theta_2$ then do not split, otherwise continue" Mancini et al. at section 6.5.1, paragraph

3, line 8; "tolerable number of outliers as a fraction of the block size" Mancini et al. at

section 6.5.1, paragraph 3, line 11) and determining whether to split the macro block

into the sub blocks,

determining the possibility of splitting the sub block by determining whether the

ratio of maximum MAD to minimum MAD of the smaller sub block is greater than a

threshold value for determining the possibility of splitting the sub block; and determining

whether to split the sub block by comparing the threshold value for determining the

possibility of splitting the sub block, the ratio of maximum MAD to minimum MAD, and a

threshold value for determining whether to split the sub block with one another, if the

ratio of maximum MAD to minimum MAD is greater than the threshold value for

determining the possibility of splitting the sub block in the operation of determining the

possibility of splitting the sub block by determining whether the ratio of maximum MAD

to minimum MAD of the smaller sub block is greater than a threshold value for

determining the possibility of splitting the sub block (covered by method above).

The Mancini et al. and Keith et al. combination does not teach comparing the

threshold value for determining the possibility of splitting the macro block with the ratio

of maximum MAD to minimum MAD, comparing the threshold value for determining the

possibility of splitting the sub block with the ratio of maximum MAD to minimum MAD,

and that the ratio greater than the threshold for determining the possibility of splitting the macro block is the ratio of maximum MAD to minimum MAD, and that the ratio greater than the threshold for determining the possibility of splitting the sub block is the ratio of maximum MAD to minimum MAD.

Boyce discloses a method comprising

comparing the threshold value for determining the possibility of splitting the macro block ("determined value B" at col. 4, line 44) with the ratio ("ratio of MAD_o /MAD_{min}" at col. 4, line 56) of maximum MAD ("MAD_o is the mean of the absolute differences between pixels in the block in a reference frame for which noise is to be reduced and the pixels in a block having the same position in another frame" at col. 4, line 28) to minimum MAD ("The matching block is the one having the minimum value of mean absolute difference, MAD, which is MAD_{min}" at col. 4, line 34),

the ratio greater than the threshold for determining the possibility of splitting the macro block is the ratio of maximum MAD to minimum MAD ("If the ratio of MAD_o /MAD_{min} is less than B, it is considered that the differences between the blocks are due to noise" at col. 4, line 56; consequently, if the ratio is greater than B, the differences are considerable enough to be further processed)

comparing the threshold value for determining the possibility of splitting the sub block with the ratio of maximum MAD to minimum MAD (same process as above)

that the ratio greater than the threshold for determining the possibility of splitting the sub block is the ratio of maximum MAD to minimum MAD (see above explanation).

It would have been obvious at the time the invention was made to one of ordinary skill in the art for the threshold value of the Mancini et al. and Keith et al. combination to be compared using the ratio taught by Boyce as described above, such that a block "caused by a poor motion estimate such as due to a change in scene so that it is not included" (Boyce at column 2, line 49).

Regarding **claims 5, 7, 31 and 33**, the Mancini et al. and Keith et al. combination discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method of splitting a block wherein the operation of setting a plurality of splitting threshold values for a macro block in an image frame and determining whether to split the macro block into sub blocks and wherein the operation of setting a plurality of splitting threshold values for each sub block and determining whether to split each sub block into smaller sub blocks comprises:

determining the possibility of splitting the macro block ("determine whether block B_{ij} requires splitting", Mancini et al. at section 6.5.1, paragraph 3, line 6) by determining whether the ratio of maximum mean absolute difference (MAD) to minimum MAD of a sub block ("$\max(\kappa_i, i = 1,...,4)/\min(\kappa_i, I = 1,...,4) < \theta_3$" Mancini et al. at section 6.5.1, paragraph 3, line 9; "ratio of the maximum to the minimum number of outliers in the four sub-blocks" Mancini et al. at section 6.5.1, paragraph 3, line 13) in the macro block is greater than a threshold value ("threshold value θ_3" Mancini et al. at section 6.5.1, paragraph 3, line 12) for determining the possibility of splitting the macro block; and

determining whether to split the macro block by comparing the threshold value for determining the possibility of splitting the macro block ("Threshold θ_2" Mancini et al.

at section 6.5.1, paragraph 3, line 11), and comparing the ratio of maximum MAD to

minimum MAD, and a threshold value for determining whether to split the macro block

with one another ("max(κ_i, i = 1,...,4)/min(κ_i, I = 1,...,4) < θ_3" Mancini et al. at section

6.5.1, paragraph 3, line 9; "ratio of the maximum to the minimum number of outliers in

the four sub-blocks" Mancini et al. at section 6.5.1, paragraph 3, line 13), if a ratio is

greater than the threshold value for determining the possibility of splitting the macro

block ("if Σ κ_i < θ_2 then do not split, otherwise continue" Mancini et al. at section 6.5.1,

paragraph 3, line 8; "tolerable number of outliers as a fraction of the block size" Mancini

et al. at section 6.5.1, paragraph 3, line 11) in the operation of setting a plurality of

splitting threshold values ("The steps above rely on three threshold values" Mancini et

al. at section 6.5.1, paragraph 3, line 10) for the macro block ("block B_{ij}" Mancini et al. at

section 6.5.1, paragraph 3, line 4) in the image frame and determining whether to split

the macro block into the sub blocks ("determine whether block B_{ij} requires splitting"

Mancini et al. at section 6.5.1, paragraph 3, line 6),

determining the possibility of splitting the sub block by determining whether the

ratio of maximum MAD to minimum MAD of the smaller sub block is greater than a

threshold value for determining the possibility of splitting the sub block (covered by

method above); and

determining whether to split the sub block by comparing the threshold value for

determining the possibility of splitting the sub block, and comparing the ratio of

maximum MAD to minimum MAD, and a threshold value for determining whether to split

the sub block with one another, if a ratio is greater than the threshold value for

determining the possibility of splitting the sub block in the operation of determining the possibility of splitting the sub block by determining whether the ratio of maximum MAD to minimum MAD of the smaller sub block is greater than the threshold value for determining the possibility of splitting the sub block (covered by method above).

The Mancini et al. and Keith combination does not teach comparing the threshold value for determining the possibility of splitting the macro block with the ratio of maximum MAD to minimum MAD, comparing the threshold value for determining the possibility of splitting the sub block with the ratio of maximum MAD to minimum MAD, and that the ratio greater than the threshold for determining the possibility of splitting the macro block and the ratio greater than the threshold for determining the possibility of splitting the micro block is the ratio of maximum MAD to minimum MAD.

Boyce discloses a method comprising

comparing the threshold value for determining the possibility of splitting the macro block ("determined value B" at col. 4, line 44) with the ratio ("ratio of MAD_o /MAD_{min}" at col. 4, line 56) of maximum MAD ("MAD_o is the mean of the absolute differences between pixels in the block in a reference frame for which noise is to be reduced and the pixels in a block having the same position in another frame" at col. 4, line 28) to minimum MAD ("The matching block is the one having the minimum value of mean absolute difference, MAD, which is MAD_{min}" at col. 4, line 34),

the ratio greater than the threshold for determining the possibility of splitting the macro block is the ratio of maximum MAD to minimum MAD ("If the ratio of MAD_o /MAD_{min} is less than B, it is considered that the differences between the blocks are due

to noise" at col. 4, line 56; consequently, if the ratio is greater than B, the differences are considerable enough to be further processed)

comparing the threshold value for determining the possibility of splitting the sub block with the ratio of maximum MAD to minimum MAD (same process as above)

that the ratio greater than the threshold for determining the possibility of splitting the sub block is the ratio of maximum MAD to minimum MAD (see above explanation).

It would have been obvious at the time the invention was made to one of ordinary skill in the art for the threshold value of the Mancini et al. and Keith et al. combination to be compared using the ratio taught by Boyce as described above, such that a block "caused by a poor motion estimate such as due to a change in scene so that it is not included" (Boyce at column 2, line 49).

Regarding **claims 8, 9, 34 and 35**, Keith et al. discloses a system comprising the steps of determining whether the preceding macro block has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked for minimum size (3924). If the target region is larger than the minimum size, it is split" at col. 27, line 16) just before determining to split the macro block (figure 39, numeral 3926),

determining not to split the macro block if the preceding macro block has not been split (figure 39, numeral 3928), and determining to split the macro block if the preceding macro block has been split (figure 39, numeral 3926)

determining whether the preceding sub block has been split just before determining to split the sub block (same method as above); and

determining not to split the sub block if the preceding sub block has not been split, and determining to split the sub block if the preceding sub block has been split (same method as above).

Regarding **claims 17, 18, 43 and 44**, the Mancini et al. and Keith et al. combination discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method wherein the operation of setting a plurality of macro block splitting threshold values for splitting a macro block in an image frame into sub blocks and determining whether to split the macro block according to whether a macro block at the same location in a preceding image frame as the current macro block has been split and wherein the operation of setting a plurality of macro block splitting threshold values for splitting a macro block in an image frame into sub blocks and determining whether to split the macro block according to whether a macro block at the same location in a preceding image frame as the current macro block has been split comprises:

determining the possibility of splitting the macro block ("determine whether block B_{ij} requires splitting" Mancini et al. at section 6.5.1, paragraph 3, line 6) by determining whether the ratio of maximum mean absolute difference (MAD) to minimum MAD of a sub block ("max(κ_i, i = 1,...,4)/min(κ_i, I = 1,...,4) < θ_3" Mancini et al. at section 6.5.1, paragraph 3, line 9; "ratio of the maximum to the minimum number of outliers in the four sub-blocks" Mancini et al. at section 6.5.1, paragraph 3, line 13) in the macro block is greater than a threshold value ("threshold value θ_3" Mancini et al. at section 6.5.1, paragraph 3, line 12) for determining the possibility of splitting the macro block,

determining whether the ratio of maximum of maximum MAD to minimum MAD is less than the threshold value for determining whether to split the macro block ("max(κ_i, i = 1,...,4)/min(κ_i, l = 1,...,4) < θ_3" Mancini et al. at section 6.5.1, paragraph 3, line 9; "ratio of the maximum to the minimum number of outliers in the four sub-blocks" Mancini et al. at section 6.5.1, paragraph 3, line 13),

determining whether the preceding macro block has been split ("region of a previous frame may be found that corresponds fairly well to a region being coded in a current frame" Keith et al. at col. 25, line 55) if the ratio is less than the threshold value for determining whether to split the macro block ("max(κ_i, i = 1,...,4)/min(κ_i, l = 1,...,4) < θ_3" Mancini et al. at section 6.5.1, paragraph 3, line 9),

determining not to split the macro block if the preceding macro block has not been split and determining to split the macro block if the preceding macro block has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked for minimum size (3924). If the target region is larger than the minimum size, it is split", Keith et al. at col. 27, line 16),

determining the possibility of splitting the sub block by determining whether the ratio of maximum mean absolute difference (MAD) to minimum MAD of the smaller sub block is greater than a threshold value for determining the possibility of splitting the sub block (covered by method above)

determining whether the ratio of maximum of maximum MAD to minimum MAD is less than the threshold value for determining whether to split the sub block (covered by method above),

determining whether the preceding sub block has been split if the ratio is less than the threshold value for determining whether to split the sub block (covered by method above); and

determining not to split the sub block if the preceding sub block has not been split and determining to split the sub block if the preceding sub block has been split (covered by method above).

The Mancini et al. and Keith et al. combination does not teach a method

determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the macro block and a threshold value for determining whether to split the macro block;

determining whether the preceding macro block has been split if the ratio is between the two threshold values in the operation of determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the macro block and the threshold value for determining whether to split the macro block

determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the sub block and a threshold value for determining whether to split the sub block;

determining whether the preceding sub block has been split if the ratio is between the two threshold values in the operation of determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the sub block and the threshold value for determining whether to split the sub block.

However, by determining whether the ratio is greater than the threshold value for determining the possibility of splitting the macro block (and subsequently the threshold value for determining the possibility of splitting the sub block), prior to determining whether the ratio of maximum of maximum MAD to minimum MAD is less than the threshold value for determining whether to split the macro block (and subsequently for the sub block), one would thereby determine whether the ratio is in between the two thresholds. If so, then determination of whether the preceding macro block (and subsequently sub block) has been split can occur.

Boyce discloses a method comprising determining whether the ratio of maximum MAD to minimum MAD ("ratio of MAD_o /MAD_{min}" at col. 4, line 56) is greater than the threshold value ("determined value B" at col. 4, line 44) for determining the possibility of splitting the macro block ("If the ratio of MAD_o /MAD_{min} is less than B, it is considered that the differences between the blocks are due to noise" at col. 4, line 56; consequently, if the ratio is greater than B, the differences are considerable enough to be further processed) and

determining whether the ratio of maximum MAD to minimum MAD is greater than the threshold value for determining the possibility of splitting the sub block (same method as above).

It would have been obvious at the time the invention was made to one of ordinary skill in the art for the threshold value of the Mancini et al. and Keith et al. combination to be compared using the ratio taught by Boyce as described above, such that a block "caused by a poor motion estimate such as due to a change in scene so that it is not included" (Boyce at column 2, line 49).

Regarding **claims 20, 21, 46 and 47**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method wherein the image frame is a binocular image frame representing a three dimensional image as described in the 103 rejection of claim 10 above.

Regarding **claims 23, 24, 49 and 50**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method wherein the operation of splitting is performed using quadtree disparity estimation as described in the 103 rejection of claim 13 above.

9.   Claims 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Mancini et al. and Keith et al. as applied to claim 42 above, and further in view of common knowledge in the art.

Regarding **claim 54**, the Mancini et al. and Keith et al. combination discloses the elements of claim 42 as shown in the 103 rejection above.

The Mancini et al. and Keith et al. combination does not explicitly disclose

determining that the ratio of maximum to minimum MAD is between the threshold

value for determining the possibility of splitting the macro block and a threshold value

for determining whether to split the macro block.

However, by determining whether the ratio is greater than the threshold value for

determining the possibility of splitting the macro block (and subsequently the threshold

value for determining the possibility of splitting the sub block), prior to determining

whether the ratio of maximum of maximum MAD to minimum MAD is less than the

threshold value for determining whether to split the macro block (and subsequently for

the sub block), one would thereby determine whether the ratio is in between the two

thresholds. If so, then determination of whether the preceding macro block (and

subsequently sub block) has been split can occur.

Regarding **claim 55**, the Mancini et al. and Keith et al. combination discloses

determining not to split the macro block if the preceding macro block has not been split

and determining to split the macro block if the preceding macro block has been split ("If

the comparison indicates that this best choice for a translated region does not provide

an acceptable match to the target region, the target region is checked for minimum size

(3924). If the target region is larger than the minimum size, it is split", Keith et al. at col.

27, line 16).

Response to Arguments

Summary of Remarks (@ response page labeled 23): "Keith et al. does not disclose determining whether or not the preceding image frame has been split".

Examiner's Response: The Examiner respectfully disagrees. In the rejection, the examiner stated,

> "a preceding macro block at the same location in a preceding image frame as the current macro block ("region of a previous frame may be found that corresponds fairly well to a region being coded in a current frame" at col. 25, line 55) has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked for minimum size (3924). If the target region is larger than the minimum size, it is split" at col. 27, line 16)".

As such, a target region that contains similarities to the previous region but is not similar enough and exceeds the minimum size threshold would be split. Blocks resulting from the split are then compared to the previous frame. A macroblock would best be matched by a corresponding unsplit macroblock but would be similar to a sub block containing similar image content as part of the current macroblock. Therefore, a close but not sufficient match of the current macroblock to the previous region is an indication that the previous image region had been split.

Summary of Remarks (@ response page labeled 23 and similarly page 24): "the different calculation methods suggested by Mancini et al. and Keith et al. result in an

impermissible combination of references due to the different image frame comparison techniques being employed".

Examiner's Response: The Keith et al. reference is a "teaching", and all of the method steps of Keith et al. are not incorporated into the Mancini et al. method. The test for obviousness is not whether the features of a second reference may be bodily incorporated into the structure of the primary reference. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Summary of Remarks (@ response page labeled 24): "Mancini et al., Keith et al. and Boyce do not disclose determining the possibility of splitting the macro block by determining whether the ratio of mean absolute difference (MAD) to minimum MAD of a sub block in a macro block is greater than a threshold value for determining the possibility of splitting the block"

Examiner's Response: As stated in the Office Action, there is a ratio of maximum to minimum number of outliers computed. The outliers are determined by the displaced pixel difference (DPD) for each block based on the median computation of the block space. Therefore, the number of outliers in each block is a mean absolute difference of that block. The threshold cited indicates that anything above it will show that the block is unreliable and therefore is split.

Summary of Remarks (@ response page labeled 24): "Mancini et al., Boyce and Keith et al. fail to disclose the ratio of the maximum to minimum MAD being between the threshold values".

Examiner's Response: In order to get to step c of Mancini's algorithm, step b must be passed, in which the amount of outliers in each block is compared to a threshold. This threshold is applicable to the ratio as well. A ratio exceeding a corresponding threshold would be an indication of too many outliers and would not have passed step b. Granted that the algorithm continues to step b, it would be above that tolerance and then compared to see whether or not it was less than the split threshold.

Conclusion

10.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

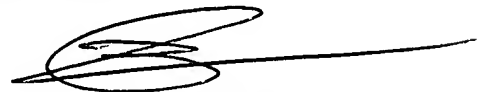than SIX MONTHS from the mailing date of this final action.

11.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Katrina Fujita whose telephone number is (571) 270-

1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

       If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Brian P. Werner can be reached on (571) 272-7401. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

       Information regarding the status of an application may be obtained from the

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USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Katrina Fujita
Art Unit 2624

BRIAN WERNER
SUPERVISORY PATENT EXAMINER